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AUG 25 2006
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Amendment to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1. (Original): A method to utilize the energy released by the molten aluminum-water reaction to do useful work by creating a dual explosion in a medium to which desired mechanical effects are to be created comprising the following steps:

a) placing in the presence of water a detonable or combustible explosive device in the said medium, the said explosive device being capable of producing aluminum in its molten state to react with water; and,

b) actuating the said explosive device to initiate the first of the said dual-explosion which is a detonation or combustion of the said explosive device, creating mechanical effects in the said medium and releasing aluminum in its molten state, wherein the molten aluminum then reacts with water to create a second explosion of the said dual-explosion, enhancing or modifying the mechanical effects created by the said first explosion.

Claim 2. (Currently Amended): The method of claim 1 wherein the said medium to which the desired mechanical effects are to be created ~~include but is not limited to~~ is one chosen from the group consisting of: water, rock stratum, concrete, steel casing ~~or tubing~~ in an oil ~~or gas~~ well, steel tubing in an oil well, steel casing in a gas well, steel casing in an oil well, hydrocarbon bearing formation ~~or~~, coal seam, and a target of any material to be attacked.

Claim 3. (Currently Amended): The method of claim 1 wherein the said mechanical effects in

the said medium are the mechanical effects for which an explosive device is designed to achieve ~~which include but are not limited to, one or a combination of the following effects~~ is one or a combination chosen from the group of effects consisting of: pressure wave generation ~~and~~, pressure wave propagation, pressurization ~~and displacement~~ of medium, displacement of medium, target penetration, target piercing ~~and~~, target fracturing, crack initialization ~~and~~, crack propagation, medium disintegration, medium fragmentation and fragment movement.

Claim 4. (Currently Amended): The method of claim 1 wherein aluminum is substituted with ~~some other light metals or their alloys~~ a light metal or its alloy which also ~~have~~ has a tendency to react with water in its molten state and release a substantial amount of thermal energy and hydrogen gas from the reaction, ~~wherein~~ such light ~~metals and alloys include but are not limited to~~ metal being one chosen from the group consisting of: magnesium, aluminum-magnesium alloy, aluminum-lithium alloy, and zirconium.

Claim 5. (Currently Amended): A method to produce aluminum in its molten state for the purpose of using the molten aluminum in a reaction with water to do useful work ~~includes~~, comprising the following steps:

a) mixing a high explosive and aluminum ~~and the content of aluminum is~~ together, with the amount of aluminum present being surplus in stoichiometry needed to react with all the detonation products of the said high explosive; and,

b) detonating the said high explosive/aluminum mixture, ~~and~~ causing the said surplus aluminum ~~is heated with~~ to absorb the detonation heat and the heat released from the

reactions between the detonation products of the said high explosive with the stoichiometrical portion of aluminum.

Claim 6. (Currently Amended): The method in claim 5 wherein the said high explosive ~~includes the explosives that are chemically compatible with aluminum which include but are not limited to~~ is one chosen from the group consisting of: RDX (Hexogen, Cyclotrimethylenetrinitramine), HMX (Octogen, Cyclotetramethylenetetranitramine), TNT (Trinitrotoluene), PETN (Pentaerythritol Tetranitrate), PYX, HNS, Ammonium Nitrate, ANFO (Ammonium Nitrate Fuel Oil), emulsion explosives and blasting agents.

Claim 7. (Currently Amended): A method to produce aluminum in its molten state ~~for using the aluminum-water to do useful work~~, comprising the following steps:

a) mixing an oxidizer with aluminum, ~~and the content~~ with the amount of aluminum [[is]] present being surplus in stoichiometry needed to react with all of the oxidizer; and

b) igniting the said ~~high~~ oxidizer/aluminum mixture, [[and]] causing the said surplus aluminum ~~is heated with~~ to absorb the heat released from the reaction between the oxidizer and the ~~stoichiometrical~~ stoichiometric portion of aluminum.

Claim 8. (Currently Amended): The method of claim 7 wherein the said oxidizer is ~~a metal oxide is a metal oxide chemically compatible with aluminum till the mixture is actuated, which includes but is not limited to~~ chosen from the group consisting of: Copper Oxide (CuO), Cuprous Oxide (Cu_2O), Ferrous Oxide (FeO), Ferric Oxide

(Fe_2O), Triiron Tetroxide (Fe_3O_4), Cobalt Oxide (Co_2O_3), Zinc Oxide (ZnO), Lead Oxide (PbO), Lead Dioxide (Pb_2O), Lead Tetroxide (Pb_3O_4) and Manganese Oxide (MnO_2).

Claim 9. (Currently Amended): The method of claim 7 wherein the said oxidizer is an oxygen rich reagent ~~which is chemically compatible with aluminum till the mixture is actuated and can be used to mix a detonable or combustible mixture with aluminum wherein such reagents include but are not limited to~~ chosen from the group consisting of: ~~nitrates like~~ Sodium Nitrate ($NaNO_3$), Potassium Nitrate (KNO_3), Barium Nitrate ($Ba(NO_3)_2$), Ammonium Nitrate (NH_4NO_3)[[;]], ~~chlorates like~~ Sodium Chlorate ($NaClO_3$), Potassium Chlorate ($KClO_3$)[[;]], ~~perchlorates like~~ Lithium Perchlorate ($LiClO_4$), Potassium Perchlorate ($KClO_4$), Strontium Perchlorate ($Sr(ClO_4)_2$) and Ammonium Perchlorate ($NH_4(ClO_4)_2$).

Claim 10. (Currently Amended): The method of claim 7 wherein the said oxidizer is [[a]] water or a water solution of oxygen-rich reagents ~~which includes but is not limited to the water solution of~~ chosen from the group consisting of: ~~nitrates like~~ Sodium Nitrate ($NaNO_3$), Potassium Nitrate (KNO_3), Barium Nitrate ($Ba(NO_3)_2$), Ammonium Nitrate (NH_4NO_3)[[;]], ~~chlorates like~~ Sodium Chlorate ($NaClO_3$), Potassium Chlorate ($KClO_3$)[[;]], ~~perchlorates like~~ Lithium Perchlorate ($LiClO_4$), Potassium Perchlorate ($KClO_4$), Strontium Perchlorate ($Sr(ClO_4)_2$) and Ammonium Perchlorate ($NH_4(ClO_4)_2$).

REMARKS

Claims 1-10 are now pending in the present application. Additionally, Claims 2-4, 6 and

8-10 have been amended.

Applicant has carefully studied the outstanding Office Action. The present Response is intended to be fully responsive to all points of rejection raised by the Examiner and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of this application are respectfully requested. No new matter has been added by any of the amendments to the specification. Applicant respectfully requests reconsideration and withdrawal of the Examiner's rejections in view of the foregoing amendments and following remarks.

CLAIM REJECTIONS – 35 U.S.C. § 112, First Paragraph

Claims 1-4

The Examiner has rejected claims 1-4 under 35 U.S.C. § 112, first paragraph, as based on a disclosure which is not enabling. In particular, the Examiner stated:

> Claims 1-4 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The ability to explode a device, and yet to only transform aluminum to a molten state, is not sufficiently disclosed. An explosion of a material such as RDX or HMX would vaporize any aluminum present with it, yet applicant claims it to be merely transformed to a molten state critical or essential to the practice of the invention, but not included in the claims is not enabled by the disclosure

This rejection is respectfully traversed. In ex parte examination of patent applications, the Patent Office bears the initial burden of setting forth a reasonable explanation as to why a claim is not adequately enabled by the description of the invention in the specification. *In re Wright*, 999 F.2d 1557, 1561-62 (Fed. Cir. 1993); *In re Marzocchi*, 439 F.2d 220, 223, 169 U.S.P.Q. 367, 369 (CCPA 1971). This initial burden includes providing sufficient reasons for doubting any assertions in the specification as to the scope of enablement. *In re Wright*, 999 F.2d at 1562; *In re Marzocchi*, 439 F.2d at 223-24, 169 U.S.P.Q. at 369-70. The test for enablement is whether the specification teaches those skilled in the art how to make and use the claimed invention without undue experimentation. *In re Vaeck*, 947 F.2d 488, 495, 20 U.S.P.Q.2d 1438, 1444 (Fed. Cir. 1991); *In re Wands*, 858 F.2d 731, 736-37, 8 U.S.P.Q.2d 1400, 1404 (Fed. Cir. 1988).

Claim 1 is the only claim covered by this rejection that specifically mentions molten aluminum. Claims 2-4 are rejected because they are dependent on Claim 1.

To prove that the device is enabled, Applicant refers Examiner to Paragraphs 0081 through 0096 of the specification wherein Applicant sets forth a detailed, step-by-step description of how one skilled in the art can calculate the ratio of aluminum to explosive material needed to create molten aluminum. Essentially, (as detailed in the specification paragraphs referenced above) enough aluminum must be present so that (1) a portion of the aluminum present consumes all of the products of detonation, and (2) a portion of unreacted aluminum remains in such amounts that the heat released by the explosive detonation reaction and the aluminum + detonation products reaction raises the temperature of the remaining aluminum to a temperature above the melting point for aluminum but below the vaporization point for aluminum. One skilled in the art will have no problem following the calculations presented in the above referenced specification paragraphs.

CLAIM REJECTIONS – 35 U.S.C. § 102

Claims 1-6

The Examiner has rejected claims 1-6 under 35 U.S.C. § 102(b) as being anticipated by Brupbacher et al (U.S. Patent No. 5,212,343) or Sumrail et al (U.S. Patent No. 5,411,615).

Claims 1-6, as amended, are novel despite the teachings of Brupbacher '343. Brupbacher '343 teaches methods which discharge ceramics, such as TiB_2, or intermetallics, such as Ni_3Al, into water for further reaction. At column 4, line 61, Brupbacher '343 teaches that the ceramics or intermetallics are created from a mixture of the powders of the individual elements, with such reactive elements present in stoichiometric amounts. In other words, the Brupbacher '343 methods use aluminum in conjunction with other elements in order to create ceramic or intermetallics; they do not use aluminum its pure molten form. Claims 1-6 of the claimed invention, on the other hand, teach methods that discharge pure molten aluminum (or other light metal that is reactive with water in its molten state) into liquid water by using aluminum in excess of stoichiometric amounts needed to react with the explosive detonation products. A rejection under §102 for anticipation requires that the single reference teach each and every element or step of the rejected claim. *See, Atlas Powder v. E.I. DuPont*, 750 F.2d 1569, 224 USPQ 409 (Fed. Cir. 1984). Because dispersing pure molten aluminum (or other light metal that is reactive to water) into water is not taught by Brupbacher '343, the §102 rejection for

anticipation is, respectfully, traversed.

Neither do the Brupbacher '343 methods use the high explosive/powderized aluminum mixture taught by the claimed invention. The Brupbacher '343 patent, at column 6, line 35, teaches methods that use a very small amount of high explosives (most preferably less than 5% of the weight of the "reactive mixture") to initiate the exothermic ceramic or intermetallic reactions that take place in the "reactive mixture." The "reactive mixture" of the Brupbacher '343 methods (Brupbacher '343, column 5, line 52) only includes the powders of the individual elements and does not include high explosives. Conversely, in the claimed invention (page 6, paragraph 0082), the high explosives are directly mixed with the aluminum powder, and the products of high explosive detonation further react with a portion of the aluminum powder, followed by the creation and dispersion of molten aluminum. Again, a rejection under §102 for anticipation requires that the single reference teach each and every element or step of the rejected claim. *See, Atlas Powder v. E.I. DuPont*, 750 F.2d 1569, 224 USPQ 409 (Fed. Cir. 1984). A prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. *In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). Respectfully, Examiner's rejection under §102 fails to meet this test.

Brupbacher '343 does not show every element of the claimed invention, and therefore, does not anticipate the claimed invention. Thus, a rejection under 35 U.S.C. § 102 is improper. Applicant respectfully requests Examiner to withdraw this rejection.

Claims 1-6, as amended, are also novel despite the teachings of Sumrail '615. Sumrail '615 teaches several eutectic high explosive compositions that use aluminum as a fuel. The aluminum in the Sumrail '615 compositions reacts with the products of the high explosive detonation to "extend the pressure pulse" of the explosion (Sumrail '615, column 2, line 61). Sumrail '615 does not teach either the creation of molten aluminum or the dispersion of molten aluminum into water for further explosion. The claimed invention does teach methods that, by including aluminum in amounts surplus of stoichiometry with the high explosive detonation products, create molten aluminum and disperse such molten aluminum into water for further reaction.

Because the Sumrail '615 patent does not show every element of the claimed invention, and therefore, does not anticipate the claimed invention, a rejection under 35 U.S.C. § 102 is improper. Applicant respectfully requests Examiner to withdraw this rejection.

Claims 7-10

The Examiner has rejected claims 7-10 under 35 U.S.C. § 102(a) or (e) as being anticipated by Graham et al (U.S. Patent No. 6,354,220).

Claims 7-10, as amended, are novel despite the teachings of Graham '220. The Graham '220 patent does teach the use of an aluminized explosive mixture in water. However, unlike the claimed invention, the Graham '220 patent, at column 2, line 20, teaches the use of aluminum in stoichiometric proportions with its reactants so that all of the aluminum is consumed in the Al + reactants reaction. The Graham '220 patent does not teach the dispersion of molten aluminum into water by including amounts of aluminum in excess of stoichoimetry, as the claimed invention does.

Because the Graham '220 patent does not show every element of the claimed invention, and therefore, does not anticipate the claimed invention, a rejection under 35 U.S.C. § 102 is improper. Applicant respectfully requests Examiner to withdraw this rejection.

The Examiner has also rejected claims 7-10 under 35 U.S.C. § 102(b) as being anticipated by Rozner et al (U.S. Patent No. 4,372,213) or Jae et al (U.S. Patent No. 5,773,750).

Claims 7-10, as amended, are novel despite the teachings of Rozner '213. While Rozner '213 does teach the use of a molten aluminum/water reaction, unlike the claimed invention, Rozner '213 accomplishes that reaction by using a pyrotechnic reaction to melt a piece of solid, machined aluminum, which then reacts with the water (Rozner '213, column 3, line 43). The claimed invention teaches the use of aluminum powder in stoichiometric surplus in order to create the molten aluminum. The use of aluminum in powder form gives the claimed invention distinct advantages over the Rozner '213 use of solid metal because a solid piece of metal will have limited heat transfer efficiency due to the fact that metal in solid form has a very limited surface area that comes into contact with the pyrotechnic reaction. This limited surface area will

not be able to absorb the heat generated by the pyrotechnic explosion due to the pyrotechnic explosion's short duration. The use of powderized aluminum in the claimed invention makes the heat transfer between the pyrotechnic explosion and the aluminum much more efficient, which will generate much greater amounts of molten aluminum than the Rozner '213 invention.

Because the Rozner '213 patent does not show every element of the claimed invention, and therefore, does not anticipate the claimed invention, a rejection under 35 U.S.C. § 102 is improper. Applicant respectfully requests Examiner to withdraw this rejection.

Claims 7-10, as amended, are also novel despite the teachings of Jae '750. The Jae '750 patent at column 3, line 32, teaches the use of water with an aluminum and metallic oxide mixture to increase the blasting force of the explosion. Although the Jae '750 patent does not disclose how this increased blasting force occurs or where it comes from, the most likely source of the added force is the energy released from the reaction between the molten ceramic Al_2O_3 (which is created by the aluminum/metallic oxide reaction) and the water present. Similar reactions are disclosed in the Brupbacher '343 patent discussed above. It can be inferred from the Jae '750 patent, column 1, line 58, that the aluminum present is in stoichiometric amounts because the patent states that the weight ratio of aluminum to metallic oxide should be "sufficient to cause an explosion." Any aluminum present in excess of stoichiometric amounts in Jae '750 would be wasted, and indeed might even hinder the effectiveness of the preferred embodiment, in the invention disclosed therein when there is no water present. Because the Jae '750 patent disclosure (at column 3, line 32) regarding the addition of water for increased blasting force says nothing about increasing the amount of aluminum present in the "dry" model, it can be assumed that no such increase was contemplated by the inventor. In contrast, the claimed invention in this case specifically discloses and claims the use of aluminum in amounts in excess of stoichiometry to create molten aluminum, which then reacts with water.

Because the Jae '750 patent does not show every element of the claimed invention, and therefore, does not anticipate the claimed invention, a rejection under 35 U.S.C. § 102 is improper. Applicant respectfully requests Examiner to withdraw this rejection.

Claims 2-4, 6 and 8-10